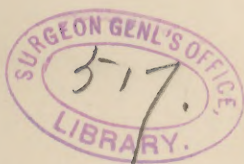


Schufeldt (R. W.)

Improved apparatus

x x x x x



The first part of the paper is devoted to a general discussion of the problem of the origin of life. It is shown that the problem is one of the most important and most difficult in the history of science. The second part of the paper is devoted to a discussion of the various theories of the origin of life. It is shown that the most plausible theory is that of spontaneous generation. The third part of the paper is devoted to a discussion of the evidence in favor of spontaneous generation. It is shown that the evidence is very strong and that it is in complete agreement with the theory of spontaneous generation. The fourth part of the paper is devoted to a discussion of the objections to spontaneous generation. It is shown that the objections are all unfounded and that they are based on a misunderstanding of the facts. The fifth part of the paper is devoted to a discussion of the conclusions of the paper. It is shown that the theory of spontaneous generation is the only one that is in complete agreement with the facts and that it is the only one that is plausible.

Random Notes on some of the Parasites of Birds.

TO THE EDITORS OF 'THE AUK':—

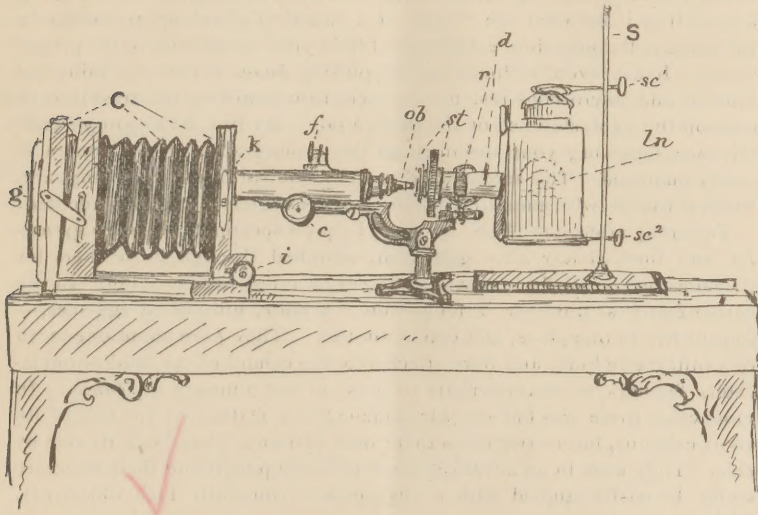
Dear Sirs:—Five or six years ago when collecting in New Mexico, I shot one afternoon some eighteen or twenty White-throated Swifts (*Aëronautes melanoleucus*), which I carried home as usual in newspaper cones in my pockets. On my way back I discovered an enormous parasite crawling along the edge of the collar of my shooting-jacket. At first it struck me that it must be some large 'pine-louse' which had fallen on me while passing through the timber earlier in the day. But as I walked along the idea came into my mind that perhaps the Swifts had something to do with it, and I at once seated myself on the prairie and took out all my specimens. Some half a dozen of them had been carefully examined before anything turned up to confirm my suspicions, when, sure enough, I came to one which had crawling among its feathers an insect apparently the very counterpart of the one I had captured on my coat. Both of these were consigned to a small bottle in my collecting-case, but a thorough going over of all the rest of my birds did not reward me with another of those interesting parasites. A few days later I sent these specimens to the distinguished entomologist Mr. Charles O. Waterhouse, of the British Museum, and he found them worthy of a notice and a figure of the insect in the 'Proceedings' of the Zoölogical Society of London for 1887 (pp. 163, 164). Mr. Waterhouse found this parasitic dipterous insect to belong to the family Hippoboscidae, and to be new to science. He called it *Anapera fimbriata*, and remarked: "It is closely allied to *Anapera pallida*, a European dipterous parasite found on *Cypselus apus*. It is, however, much larger, and is at once distinguished by the almost total absence of wings—a character which might, by some, be considered of generic importance. Having only two examples, which appear to be females, I prefer for the present to place the species in the genus *Anapera*."

My attention had never been especially drawn to this interesting subject before, nor have I since had much opportunity to look very closely into it. But it has often occurred to me, that if we were familiar with a great many of the parasites of our birds, they might in some instances prove to be of service in the classification of the birds themselves. Now in the case of those Swifts,—there we find two species, belonging, one each, to widely-separated countries. The extraordinarily large and unusual parasites found on them are also of the same genus, yet of very distinct species. It would be interesting now to know whether this parasite—*Anapera fimbriata*—is found upon any of our other species of Swifts, or whether they have different kinds infesting them. None of my ornithological friends seem to have given much attention to this subject, and, beyond the writings of Leach, Nitzsch, and Burmeister, I am not especially familiar with the literature of the subject. Sly peeps into Dame Nature's secrets

are sometimes the most seductive of all the glimpses we catch of her, and a few days ago the notion entered my head to do a little prying,—but only in the direction that has just been indicated.

Every one of us who have collected birds have often noticed that if the specimens are set aside for a few hours, and the bodies become cold; numerous little parasites which have infested them during life now crawl out upon the ends of the feathers or bristles around the base of the mandibles. Here they will often remain until they starve to death and fall off, or disappear in other ways. Hundreds of times I have looked at them with a high-power hand-lens with great interest, but never made any sketches of them, as I had at that time devised no means to do so with accuracy. Later, I was again attracted to the subject, but owned no micro-photographing instrument of any kind. But a day or so ago I determined to overcome this most serious difficulty and improvise a micro-photographing apparatus, of some form or other, and in the venture I succeeded far beyond my most sanguine expectations.

This is the way I did it, and my sketch of the affair as finally set up is given below and will help my readers to comprehend my remarks about it. These I will give in some little detail as I hope to have others inves-



DR. SHUFELDT'S IMPROVISED APPARATUS FOR MAKING MICRO-PHOTOGRAPHS OF THE PARASITES OF BIRDS.

C: Camera-box; *g*, ground-glass; *k*, the card-board front where the body of the microscope enters the camera; *i*, focussing screw of camera-bed; *f*, fine adjustment screw of microscope, and *c*, the coarse adjustment; *ob*, objective; *st*, stage and substage; *v*, rubber-band holding the lens of lantern and substage condenser together; *d*, diaphragm in lantern lens; *s*, standard for lantern; *ln*, dark-room lantern of photographic outfit; *sc¹*, *sc²*, screws to standard, by means of which the lantern can be lowered or raised.



tigate and describe some of these parasites of our birds. Most naturalists nowadays own a camera and outfit, and also a microscope and its outfit. This is my case. In the first place then I took my largest camera and placed it on a long table as shown in the sketch. I removed its lens and lens-board, and fitted a cardboard front to take its place at K. Next I took my largest microscope, — a Beck's Monocular National — and brought it into the horizontal position. I fitted the upper end of its body, while in this position, into the cardboard front of the camera (K). A substage condenser, and a $\frac{3}{4}$ inch objective were next attached to the microscope, and the camera and the latter coupled together. Now most micro-photographers omit using the eye-piece of the microscope, but with it I subsequently obtained the best results. It is inserted *after* the barrel or body of the microscope is run through the cardboard into the front part of the camera-box.

For an *illuminator* I used the dark-lantern of my photographic outfit, — simply withdrawing the ruby-glass slide in front, and fitting in its place a thick piece of cardboard, into the centre of which I inserted the lens from a small camera to act as a 'bull's-eye condenser.' This is coupled with the substage condenser on the microscope by means of a broad rubber band, shown at *r*. My lantern I held nicely in the proper position by suspending it between the 'rings' of a chemical standard, as shown in my sketch; but any simple device will hold your lantern up in its proper place. It can even be 'built up' by putting *books* under it. Both the lantern and microscope rest upon a very thin board which travels with ease on the extension-bed of the camera-box. By this latter simple contrivance, focussing your specimen on the ground-glass of the camera is easily managed. The screws at *f*, *c*, and *i* control the whole thing, and the rest can be with ease understood from my sketch of the plan adopted.

Yesterday afternoon (Feb. 27, 1894) I shot a specimen of *Junco hyemalis*, and immediately after getting it, searched through its feathers for parasites but could find none after fifteen minutes' hard-looking. In the throat-feathers, however, I found some minute, ellipsoidal egg-sacs, — four or five in one place, and two in another. They were about one-tenth of a millimetre long, and were attached to the calami of the semi-plumaceous feathers so characteristic of most of the plumage of *Junco*. In most cases there was but one sac attached to a feather, at the side of its short calamus, but in two cases there were two sacs, placed exactly side by side. They were in an advanced stage of development and their structure could be easily studied with a high-power (one-fifth inch objective), without staining.

In a few hours my *Junco* was cold and rigid, and two parasites were found upon his chin-feathers. They measured but a small fraction of a millimetre, and were of the same species, — apparently ♂ and ♀. One was rather larger than the other and darker. I got them both on a minute feather, and between two microscopic 'glass-slides,' and on to the stage of the microscope. As soon as the light was turned on they were

thrown up on to the ground-glass of my camera at *g*, as big as two small crabs! They could be focussed *sharp*, and studied with the greatest ease, — and of course there would be no difficulty in obtaining a first-rate photograph of them. It was most remarkable to see them get round through the barbles of the feathers, or at times suck the blood from an unopened 'pin-feather.' Some of their antics were very curious. This species has a large triangular head; six legs, terminating in hooked claws for climbing among the feathers of the bird's plumage. They also hold on with their mandibles, which are situated near the centre of the ventral aspect of the head. Antennæ are lateral, and the whole insect is sparsely, very sparsely, covered with little spine-like hairs. I studied them for two hours with great interest and profit, and towards the last quite forgot the fact that the *real insect* was so small as to be scarcely observable by the naked eye. On the ground-glass of the camera they were between three and four inches long.

I believe this to have been the only pair of the kind on the bird, but in a few hours another species appeared on the feathers of the throat of my Junco, — about a dozen or more of them. These were *white*, barely discernible to the naked eye, and very active. They were entirely different in form from the first pair secured, and at the present writing I have not studied them very closely.

This is all I have to say about this subject just at present, but in conclusion let me add that I would be glad to have the titles of any works devoted especially to these forms of parasites as they have been described for birds in general, and for United States birds in particular. It would seem that a special memoir devoted to full descriptions of this class of insects, and illustrated by micro-photographs of the various species, would, apart from its value to the entomologist, prove of interest to the avian taxonomer.

Very respectfully,

R. W. SHUFELDT.

Takoma, D. C., Feb. 27, 1894.

